

CONSISTENCY TESTING OF THE IRDF-2002 DOSIMETRY CROSS SECTION LIBRARY

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The new IRDF-2002 dosimetry cross section library is due to be released by the IAEA in January 2004. An important aspect of the new library development and release process was the "consistency" testing of these cross sections in "reference" neutron fields. This paper reports on and quantifies the degree of consistency in the testing.

Uncertainties addressed in the C/E integral metrics include: experimental activity measurements, characterization of the neutron reference field spectra, and uncertainty in the evaluated dosimetry cross section. One major limitation encountered in gathering activation data from reference neutron fields was the difficulty in obtaining uncertainties and covariance matrices for the neutron spectra in the reference fields. The Sandia Pulsed Reactor (SPR-III) and the Annular Core Research reactor (ACRR) were two reference benchmark neutron fields used to support the testing. The IRDF-2002 library consists of 65 different reactions. Thirty one of these reactions were addressed and found to be consistent with each other in these two neutron fields. Experimental activities were not available for 26 other reactions. Six of the remaining reactions are partial cross sections that are addressed in composite form in other library entries. The two remaining cases are reactions where either the short half lives or self shielding considerations have resulted in requests that additional experimental data be gathered in the fields.

Data in the reference fields were gathered for reactions using bare foils as well as cadmium and enriched ^{10}B boron carbide covers. For several reactions, the bare and boron-covered C/E ratios were fine, but the cadmium-covered reaction had C/E values that were off by more than two standard deviations. Inspection of the C/E ratios for the covered foils identified what is thought to be problems with the ^{nat}Cd absorption cross sections just above the Cd cut-off energy. The absence of any uncertainty data for the cadmium absorption cross section and the sparse data for cadmium absorption cross sections seen in the ENSDF database leads to questions about the quality of the cadmium cross sections in the resonance region.

This cross section consistency testing 1) demonstrates to users of the IRDF-2002 library which reactions have been validated so that they can evaluate any discrepancies that they observe when using these dosimetry cross sections for spectrum determinations purposes; 2) identifies needs for additional dosimetry data in reference neutron fields; 3) identified problems in the cadmium cross sections.